I/We Claim:

1. Apparatus for use in a bidirectional optical wavelength division multiplexed transmission system in which first direction odd-numbered channels are interleaved with opposite direction even-numbered channels comprising

first and second terminals, and

a gain block inserted between the two terminals for amplifying both odd-numbered channel signals propagating from said first to said second terminal and even-numbered channel signals propagating from said second terminal to said first terminal, characterized in that the gain block includes an interleaver means for selectively transmitting odd-numbered channel signals propagating codirectionally from said first to said second terminal and for selectively transmitting even-numbered channel signal propagating codirectionally from said second terminal to said first terminal, said interleaver means positioned to block counterdirectional signals of said channels.

2. The apparatus of claim **1** in which the gain block includes a pair of paths between said first and second terminals and separate interleaver means are included in each path.

3. The apparatus of claim **2** in which the first path of the gain block includes an amplifier poled to amplify signals propagating in the direction from the first terminal to said second terminal and the second path of the gain block includes an optical amplifier poled to amplify signals propagating in the direction from the second terminal to the first terminal.

4. The apparatus of claim **3** in which a separate interleaver means is connected ahead of each optical amplifier.

5. The apparatus of claim **3** in which a separate interleaver means is also connected behind each optical amplifier.

6. A gain block for insertion in a span between two spaced terminals of a bidirectional optical transmission line for amplification selectively only of codirectional signals of two sets of interleaved wavelengths, the signals of the two sets having different directions of assigned travel between the two terminals comprising

a pair of routing elements,

a pair of optical amplifiers,

two multiport interleaver means each having assigned pairs of port for selective-high transmissivity, characterized in that the foregoing elements are arranged so that input signals of the first set from the first terminal pass in turn through the first routing element, the first optical amplifier, its assigned ports of the first interleaver means, and the second routing element, and so that input signals of the second set from the second terminal pass in turn through the second routing element, the second optical amplifier, its assigned ports of the second interleaver means, and the first routing element.

7. The gain block of claim **6** that further includes a third optical amplifier between the first interleaver means and the second routing element and a fourth optical amplifier between the second interleaver means and the first routing element.

8. A gain flock for insertion between two spaced-apart terminals of a bidirectional optical transmission system for selective amplification only of codirectional signals of two sets of interleaved wavelengths, the two sets having opposite assigned directions of transmission comprising

a pair of multiport interleaver means having assigned pairs of ports selectively of high transmissivity and a pair of optical amplifiers characterized in that the foregoing elements are arranged so that input signals of the first set from the first terminal pass in turn through their assigned ports of the first interleaver means, the first optical amplifier and their assigned ports of the

second interleaver means to the second terminal, and input signals of the second set from the second terminal pass in turn through their assigned ports of the second interleaver means, the second optical amplifier, and their assigned ports of the first interleaver means to the first terminal.

9. A gain block for insertion in a span between two spaced-apart terminals of a bidirectional optical transmission line for amplification selectively only of codirectional signals of two sets of interleaved wavelengths, the two sets having different directions of assigned travel along the transmission line between the two terminals comprising

a pair of multiport routing elements at opposite ends of the span of transmission line,

a pair of optical amplifiers,

a multiport interleaver means for providing gain selectively in codirectional signals traveling between an assigned pair of its ports, the pair being different for the two sets of interleaved wavelengths,

a reflector,

said above-mentioned elements being connected optically such that the first set of signals supplied at the first of the two terminals arrives at the second of the two terminals be way in turn of the first routing element, the interleaver means, the firstreflector, the interleaver means, the first optical amplifier and the secondrouting element, and the second set of signals supplied at the second of two terminals arrives at the first of the two terminals by way of the second routing element, the interleaver means, the reflector, the interleaver means, the second routing element, the second optical amplifier, and the first routing element.

10. A gain block for insertion in a span between two spaced terminals of a bidirectional transmission line for amplification selectively only of codirectional signals of two sets of interleaved wavelengths, the two sets having different directions of assigned travel along the transmission between the two terminals comprising

a pair of multiport routing elements at opposite ends of the span of transmission line,

a pair of optical amplifiers,

a pair of multiport interleavers means, each for providing gain selectively to codirectional signals traveling between a pair of assigned ports, the pair being different for the two sets of interleaved wavelengths, and

a pair of mirrors,

said above-mentioned elements being connected optically such that the first set of wavelengths supplied as inputs to the first terminals arrives as the output at the second terminal by way of the first routing element, a first passage through the first interleaver means, reflection at the mirror, a second passage through the first interleaver means, a second passage through the first routing element, passage through the first optical amplifier for amplification, passage through the second routing element to the second terminal, and the second set of interleaved wavelengths travels to the first terminal by way of the second routing element, a first passage through the second interleaver means, reflection at the second mirror, a second passage through the second interleaver means, a second passage through the second routing element, amplification in the second optical amplifier, and passage through the first routing element to the first terminal.

11. A gain block for insertion in a span between two spaced-apart terminals of a bidirectional optical transmission line for amplification selectively only of codirectional signals of two sets of interleaved wavelengths, the two sets having opposite directions of assigned travel along the transmission line between the two terminals, comprising

a pair of circulators,

a pair of optical amplifiers,

four multiport interleavers used for providing gain selectively between an assigned pair of ports, the pairs being different for the two sets of interleaved wavelengths, characterized in that the above-mentioned elements are arranged such that the first set of signals when supplied to the terminal arrives at the second terminal by way in turn of the first circulator, its assigned

ports of the first interleaver, its assigned ports of the second interleaver, the first optical amplifier, its assigned ports of the third interleaver, its assigned ports of the fourth interleaver, and the second circulator to the second terminal, and the second sets of signals when supplied to the second terminal passes in turn through the second circulator, its assigned ports of the fourth interleaver, its assigned ports of the third interleaver, the second optical amplifier, its assigned ports of the second interleaver, its assigned ports of the first interleaver and the first circulator to the first terminal.

12. A gain block for insertion in a span between two spaced-apart terminals of a bidirectional optical transmission line for amplification selectively only of codirectional signals of two sets of interleaved wavelengths, the signals of the two sets having opposite assigned directions of transmission between the two terminals comprising

a pair of multiport interleavers each having assigned pairs of ports selectively of high transmissivity, a pair of circulators, and a pair of amplifiers in which the foregoing are arranged such that signals of the first set applied to the first terminal pass in turn through assigned ports of the first interleaver, the first circulator, the bidirectional amplifier, the second circulator, assigned ports of the second interleaver to the second terminal, and the second set of signals supplied from the second terminal passes in turn through assigned ports of the second interleaver, the second circulator, the bidirectional amplifier, the first circulator and assigned ports of the first interleaver to the first terminal.

13. A gain block for use in a bidirectional optical transmission line for insertion between two terminals in the line comprising

a multiport interleaver having first and second terminals between which the gain block is to be inserted comprising

a multiport interleaver having pairs of assigned ports between which the transmissivity is selectively high,

a circulator,

a bidirectional optical amplifier and a mirror,

characterized in that said foregoing elements are arranged such that a first set of two sets of interleaved wavelengths is applied from the first of the two terminals to a first port of an assigned pair of ports for travel in turn through the interleaver and exiting at the second of the assigned pair of ports for travel in turn through the circulator and bidirectional optical amplifier to the mirror, and after reflection returns through the circulator to one of a pair of assigned ports of the interleaver for exit at the other port of the assigned pair to the second terminal, and the second set of the two sets when applied to the second terminal travels to the first terminal by way of assigned ports of the interleaver, the circulator, the bidirectional amplifier and the mirror, and returns, after reflection, by the mirror, through the bidirectional amplifier, the circulator and the interleaver to the first terminal.